



## CULVERT PIPE LINER MSP-90-06H

### **1.0 Description.**

**1.1** This work shall consist of furnishing and placing pipe liners in existing pipes as indicated in the plans.

**1.2** Unless otherwise stated, specification section references are from the version, in effect at the time of this contract, of the Missouri Standard Specifications for Highway Construction and its supplements.

### **2.0 Materials.**

**2.1 Liner Pipe.** Pipe shall be PE or PVC as listed and shall comply with the requirements for the Type listed.

**2.1.1 Type I.** Type I PE pipe shall comply with the requirements of ASTM F 714 (Max. DR 32.5).

**2.1.2 Type II.** Type II PE pipe shall be manufactured from material meeting ASTM D 1248, Type III, Category 5, Class C, Grade P34 and shall comply with the dimensional requirements of Table 1 of this specification.

**2.1.3 Type III.** Type III PE pipe shall comply with the requirements of ASTM F 894 open profile, Class RSC 100 or RSC 160.

**2.1.4 Type IV.** Type IV PVC pipe shall meet the specifications of ASTM F-949, except that the PVC Pipe & Fittings shall be made of PVC compound having a minimum cell classification of 12454B in accordance with ASTM D 1784. The joining method for PVC pipe shall be by elastomeric material meeting the requirements of ASTM F-949. (Note: Clearance requirements limits the minimum size of Type IV to a 15" diameter and ASTM F-949 currently limits the maximum size to a 36" diameter.)

**2.2** The dimensions of PE pipe shall meet the requirements of Table 2 of this specification. The length shall not be less than that specified in the contract.

**2.3 Grout.** Grout shall meet the requirements of Section 1066.

### **3.0 Construction Requirements.**

**3.1** Before any liner construction is started, existing culvert pipes shall be thoroughly cleaned of all sediment and debris.

**3.2** The liner pipe shall be joined into a continuous length by the butt fusion method in accordance with ASTM D 2657, or by an approved interlocking method formed into the ends of the liner pipe by the manufacturer. The engineer will approve each joint before each section of liner pipe is inserted.

**3.3** The ends of the existing culvert pipes may be removed to provide additional working room and convenience when constructing the pipe liners. Culvert ends that have been damaged shall be straightened or removed at the contractor's discretion.

**3.4** The insertion may be made by pushing or pulling the assembled liner pipe from either end of the culvert. The insertion operation shall not cause the joints to separate in any way. The engineer may require the liner to have a temporary nose cone or plug to guide the liner pipe past minor obstructions. The handling of liner pipe shall be in such a manner that the pipe is not damaged. Pipe with deep scratches or gouges shall be removed and replaced.

**3.5** After the liner has been completely inserted and has been inspected in place by the engineer, it shall be cut off as directed by the engineer and grouted in place. Liner pipe, that has been exposed to the sun before the insertion is made, shall be allowed to cool to the temperature of the existing culvert before it is cut off and grouted.

**3.5.1** Only enough water to make a stiff, but workable, expansive grout shall be used.

**3.5.2** The grout shall extend into the annular space between the existing culvert and liner for a minimum distance of 6 inches (150 mm) to a flexible grout stop comprised of flexible foamed polyethylene, pavement joint backer rod, wadded newspaper, or other material approved by and installed to the satisfaction of the engineer.

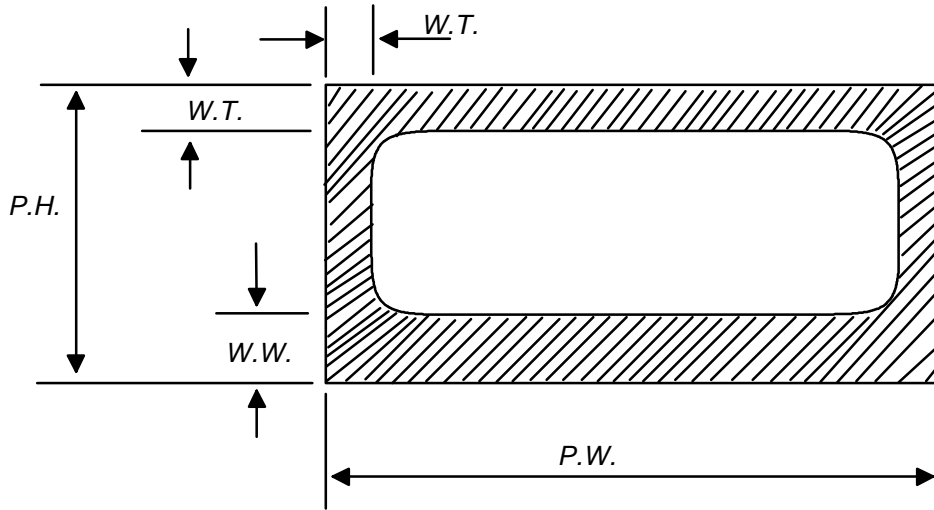
**3.5.3** Drainage of the annular space between the culvert and culvert liner shall be provided by drilling a circumferential line of weep holes in the lower half of the liner pipe just upstream from the downstream grout stop. The weep holes shall not be less than 3/8-inch nor more than 1/2-inch (10 mm nor more than 15 mm) in diameter and shall be spaced circumferentially at 3-inch (75 mm) centers starting at the invert and extending upwards to the spring line of the liner.

**3.6** The liner shall be anchored to the existing culvert by a minimum of two 1/2-inch (12.7 mm) diameter bolts with washers. The liner shall be centered in the existing pipe and anchor bolts installed at the upstream end, spaced equal distance, above the spring line.

**4.0 Certification.** The contractor shall furnish, in triplicate, a manufacturer's certification stating that the pipe liner was manufactured and tested in accordance with these specifications and was found to meet the requirements for this contract.

**5.0 Method Of Measurement.** Measurement of culvert liner, complete in place, will be made to the nearest foot (meter) along the geometrical center of the pipe. Final measurement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity. This item shall include all materials, labor, equipment and excavation necessary to complete the work.

**6.0 Basis Of Payment.** The accepted quantities for the culvert liner complete in place will be paid for at the unit price for the pay items included in the contract.

**Table 1 - Type II PE Pipe**

Nominal I.D. PPPL Size inches (mm) <sup>A, B</sup>	Average O.D. inches (mm) <sup>A</sup>	Average Profile Height (P.H.) inches (mm) <sup>A</sup>	Average Profile Width (P.W.) inches (mm) <sup>A</sup>	Minimum Waterway Wall (W.W.) inches (mm)	Minimum Wall Thickness (W.T.) inches (mm)
10 (254)	11.20 (284)	0.60 (15.2)	0.74 (18.8)	0.07 (1.8)	0.06 (1.5)
12 (305)	13.47 (342)	0.74 (18.8)	0.92 (23.4)	0.08 (2)	0.07 (1.8)
13.5 (343)	15.36 (390)	0.93 (23.6)	1.16 (29.5)	0.09 (2.3)	0.08 (2)
15 (381)	16.85 (428)	0.93 (23.6)	1.16 (29.5)	0.09 (2.3)	0.08 (2)
18 (457)	20.24 (514)	1.12 (28.5)	1.40 (35.6)	0.11 (2.8)	0.10 (2.5)
21 (533)	23.65 (601)	1.33 (33.8)	1.66 (42.2)	0.13 (3.3)	0.11 (2.8)
24 (610)	27.06 (687)	1.53 (38.9)	1.91 (48.5)	0.14 (3.6)	0.12 (3.1)
27 (686)	30.34 (771)	1.72 (43.7)	2.15 (54.6)	0.16 (4.1)	0.14 (3.6)
30 (762)	33.82 (859)	1.91 (48.5)	2.39 (60.7)	0.18 (4.6)	0.15 (3.8)
36 (914)	40.65 (1033)	2.33 (59.2)	2.91 (73.9)	0.21 (5.3)	0.18 (4.6)
40 (1016)	45.20 (1148)	2.60 (66)	3.25 (82.6)	0.23 (5.8)	0.20 (5.1)
42 (1067)	47.47 (1206)	2.74 (69.6)	3.42 (86.9)	0.24 (6.1)	0.21 (5.3)

<sup>A</sup> These dimensions shall be determined by taking at least three (3) measurements and averaging the results.

<sup>B</sup> A tolerance of  $\pm 1$  percent will be permitted on the nominal I.D. measurements.

<b>TABLE 2</b>			
<b>PIPE LINER DIMENSIONS</b>			
<b>Existing Pipe</b>	<b>Liner</b>		
	<b>Clearance *</b>		<b>ID</b>
<b>Size (ID) inches (mm)</b>	<b>Minimum inches (mm)</b>	<b>Maximum inches (mm)</b>	<b>Minimum inches (mm)</b>
12 (305)	0.5 (12)	2 (50)	9 (225)
15 (381)	0.5 (12)	2 (50)	11 (275)
18 (457)	0.5 (12)	3 (75)	13 (330)
21 (533)	0.5 (12)	3 (75)	15 (380)
24 (610)	0.5 (12)	4 (100)	17 (430)
27 (686)	1 (25)	4 (100)	20 (505)
30 (762)	1 (25)	4 (100)	22 (555)
33 (838)	1 (25)	4 (100)	24 (610)
36 (914)	1 (25)	4 (100)	26 (660)
42 (1067)	1 (25)	6 (150)	30 (760)
46 (1168)	2 (50)	6 (150)	33 (835)
48 (1219)	2 (50)	6 (150)	35 (885)
54 (1372)	2 (50)	8 (200)	39 (990)
60 (1524)	2 (50)	9 (225)	43 (1090)
72 (1829)	2 (50)	10 (250)	52 (1320)

\* Clearance is the difference between the inside diameter (ID) of the existing pipe and the outside diameter (OD) of the liner.